The data structure

```
1  class DJSets { vector<int> s; };
2
3  DJSets::DJSets( int n ) : s( n, -1 ) { }
4
5  void DJSets::unionSets( int rA, int rB ) {
6      if( s[ rB ] < s[ rA ] ) s[ rA ] = rB;
7      else {
8          if( s[ rA ] == s[ rB ] ) --s[ rA ];
9          s[ rB ] = rA;
10     }
11 }
12
13 int DJSets::find( int x ) {
14     if( s[ x ] < 0 ) return x;
15     else    return find( s[ x ] );
16 }
```

The visualization

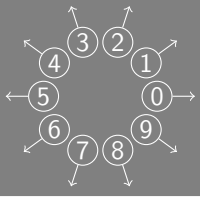
main

```
// BEGIN
DJSets djSet{10};
cout << djSet.find(4);
```

vector s

-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

The graph

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17  }
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The visualization

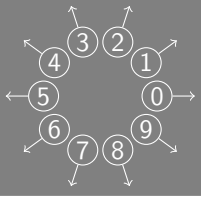
main

```
DJSets djSet{10};
cout << djSet.find(4); // 4
cout << djSet.find(2);
```

vector s

-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

The graph

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15     if( s[ x ] < 0 ) return x;
16     else     return find( s[ x ] );
17 }
```

The visualization

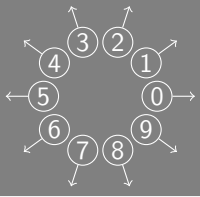
main

```
cout << djSet.find(4); // 4
cout << djSet.find(2); // 2
djSet.unionSets(4, 2);
```

vector s

-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

The graph

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15      if( s[ x ] < 0 ) return x;
16      else     return find( s[ x ] );
17  }
```

The visualization

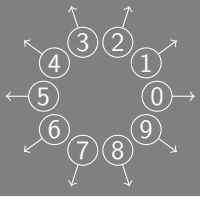
main

```
cout << djSet.find(2); // 2
djSet.unionSets(4, 2);
cout << djSet.find(4);
```

vector s

-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

The graph

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```

The visualization

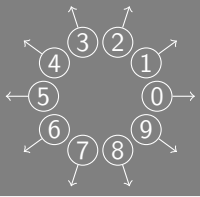
main

```
cout << djSet.find(2); // 2
djSet.unionSets(4, 2);
cout << djSet.find(4);
```

vector s

-1	-1	-1	-1	-2	-1	-1	-1	-1	-1

The graph

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17  }
```

The visualization

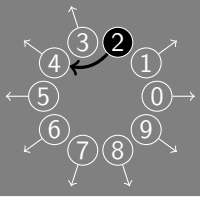
main

```
cout << djSet.find(2); // 2
djSet.unionSets(4, 2);
cout << djSet.find(4);
```

vector s

-1	-1	4	-1	-2	-1	-1	-1	-1	-1

The graph

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17  }
```

The visualization

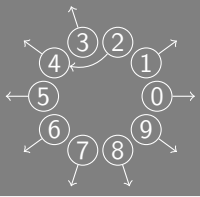
main

```
djSet.unionSets(4, 2);
cout << djSet.find(4); // 4
cout << djSet.find(2);
```

vector s

-1	-1	4	-1	-2	-1	-1	-1	-1	-1

The graph

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14  int DJSets::find( int x ) {
15      if( s[ x ] < 0 ) return x;
16      else     return find( s[ x ] );
17  }
```

The visualization

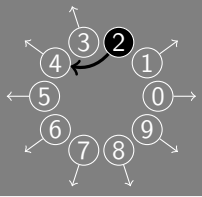
main

```
cout << djSet.find(4); // 4
cout << djSet.find(2); // f(4)
djSet.unionSets(4, 3);
```

vector s

-1	-1	4	-1	-2	-1	-1	-1	-1	-1

The graph

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17 }
```

The visualization

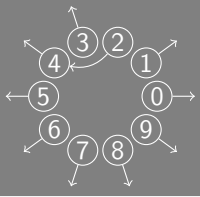
main

```
cout << djSet.find(4); // 4
cout << djSet.find(2); // 4
djSet.unionSets(4, 3);
```

vector s

-1	-1	4	-1	-2	-1	-1	-1	-1	-1

The graph

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```

The visualization

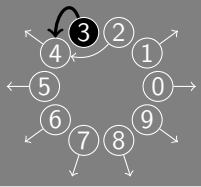
main

```
cout << djSet.find(2); // 4
djSet.unionSets(4, 3);
cout << djSet.find(3); // f(4)
```

vector s

-1	-1	4	4	-2	-1	-1	-1	-1	-1

The graph

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The visualization

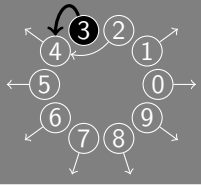
main

```
djSet.unionSets(4, 3);
cout << djSet.find(3); // f(4)
// END
```

vector s

-1	-1	4	4	-2	-1	-1	-1	-1	-1

The graph

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The visualization

main

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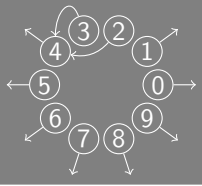
cout << djSet.find(3); // 4
// END
```

vector s

-1	-1	4	4	-2	-1	-1	-1	-1	-1

The graph

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